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McCracken gunshot-residue test flawed, experts say

By John Woestendiek
Inquirer Staff Writer

When Robert Saunders, a retired chemist turned state police scientist, took the witness stand at the murder trial of Terry McCracken in October 1983, he impressed the jury with his wit, his wisdom and his down-home charm.

He made them smile when he remarked that it was because of his wife's complaints about him "getting underfoot" that he had gone back to work — first as a college science teacher and then, in 1976, as a criminalist at the Pennsylvania State Police laboratory in Lima.

And he persuaded them, most members of that jury say, that his laboratory testing had shown that McCracken, on trial for a March 18, 1983, killing in Collingdale, Delaware County, had fired a gun that day.

But Saunders made a mistake in his testimony, according to six experts interviewed by *The Inquirer*, including the California scientist who helped develop the test Saunders used and a supervisor at the FBI crime laboratory in Washington.

That mistake played a large role in the conviction of McCracken, at age 19, for a murder he may not have committed.

McCracken, now 22, has been in Delaware County Prison for more than three years, where he is awaiting Delaware County Judge Robert A. Wright's decision on whether to grant his motion for a new trial or formally sentence him to the mandatory penalty of life in prison. Wright has scheduled a hearing for May 16

on McCracken's motion for a new trial.

In telephone interviews last week, five gunshot-residue experts from across the country said that, based on Saunders' description of what he found in his laboratory analysis, there was no scientific basis for the conclusion he made in court.

Their opinions echoed those of Peter F. Jones, a California scientist who, because he helped develop the test that was used on McCracken's hands, was retained by *The Inquirer* to review Saunders' report and testi-

mony.

Saunders conducted his analysis using the latest technology for detecting gunshot residue — a method so recently developed, in fact, that in Delaware County, Philadelphia and even Pennsylvania, there probably are few, if any, scientists familiar enough with it to rebut Saunders' findings in court.

"Saunders can and does go virtually unchallenged," said George Fasnacht, a former CIA agent and firearms expert who now works as a private consultant in Philadelphia.

"His method is used by very few laboratories, and very few people around here are acquainted with it."

Saunders testified in court that, although he did not find antimony or barium in the samples taken from McCracken's hands, he did locate two spherically shaped lead particles that — based on their size and shape, he said — he identified as gunshot residue.

"That's a most dubious conclusion. ... It's pretty flimsy," said Vincent P. Guinn, a chemistry professor at the University of California at Irvine and developer of one of the three methods of gunshot-residue testing in use today.

"We wouldn't go along with it," said John W. Kilty, chief of the elemental-analysis unit of the FBI crime laboratory. Kilty said that without the presence of barium and antimony — two elements contained in cartridge primer — an absolute determination could not be made.

Declined comment

Saunders and his supervisor at the state police crime lab in Lima, Delaware County, declined to comment on the McCracken case or on gunshot-residue testing in general and referred questions to the state police public-information office in Harrisburg.

A spokesman there said Wednesday that state police now perform all gunshot-residue tests at their crime laboratory in Harrisburg and that they no longer use the method that Saunders employed in Lima.

Saunders' tests, which were conducted with a scanning electron microscope and an X-ray device, were ceased in September when the apparatus broke down.

"We have not repaired it because it's a very expensive proposition," the state police spokesman said.

The spokesman said that he was unable to comment on Saunders' findings in the McCracken case and that he could not supply figures on how many analyses for gunshot residue Saunders had performed or had testified about.

The Delaware County district attorney's office has said that it stands by Saunders' conclusions.

Saunders, 71, who received a doctorate in physical organic chemistry at the Illinois Institute of Technology in 1943, testified in court in 1983 that he had conducted about 250 gunshot-residue tests at the Lima crime lab.

Saunders retired in 1970 from Hercules Inc., a chemical company where he had worked as a research chemist and research supervisor. In 1976, he went to work at the Lima crime lab, which was originally established by Delaware and Chester Counties but was taken over by the state police in October 1982.

McCracken was convicted of second-degree murder on Oct. 25, 1983. Jurors have said in interviews that their verdict was based mainly on Saunders' testimony, a witness' identification of McCracken at the crime scene and the similarity between McCracken's clothing and the clothing that the gunman was described as wearing.

An *Inquirer* investigation has since raised doubts about McCracken's guilt and about some of the evidence used to convict him.

Took test voluntarily

It was about three hours after David Johnston, 71, was shot during a holdup at Kelly's Deli in Collingdale that McCracken, because of similarities between his clothing and the gunman's, was taken to police headquarters in Collingdale.

There, McCracken volunteered to submit to the gunshot-residue test. A detective, using a kit that contained

corks coated with adhesive, took samples from McCracken's hands and sent those samples to the state police crime laboratory in Lima.

Three days later, McCracken was charged with the robbery and killing after a witness — who originally told police that he did not recognize the man he saw fleeing Kelly's Deli after the holdup — changed his story and said the man was McCracken.

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Four days after that, on March 25, 1983, Saunders issued his report on the samples taken from McCracken's hands. In that one-page report, he said he had found lead-containing particles "characteristic of gunshot residue" on the sample taken from McCracken's left hand. He also noted in the report that the samples had been destroyed during the testing.

But seven months later, when the case came to trial, Saunders would drop his use of a key word — *characteristic*. He would state repeatedly, and without qualification, that he had found gunshot residue. He would say that there were no other sources for the particles he found on the sample. And he would say in court that the sample might, or might not, have been destroyed during testing.

In the 1930s, the first test aimed at determining whether a person had recently fired a gun came into use.

It was called the paraffin, or dermal-nitrate, test. Melted wax was applied to the palm and back of a suspect's hands and, upon hardening, removed. A chemical solution that reacted to gunpowder was then applied to the wax mold; if it turned blue, the test was considered positive.

In the early 1960s, the paraffin test was discredited because of the high number of "false positives" uncovered in testing. Today, though still used by some police departments for interrogative purposes, paraffin tests are considered obsolete.

"It was quite subjective — you might as well have flipped a coin — and it was eventually found to be so totally unreliable it was dropped," said Guinn of the University of California. "For a while there was no satisfactory test."

In the mid-1960s, research by Guinn and his associates led to a new method of testing, called nuclear activation analysis, still the most widely used technique. Under that method, and a subsequently developed method — flameless atomic absorption spectrophotometry — tests are conducted on samples that have been removed from a person's hands with cotton swabs soaked in a chemical solution.

Analyses of those samples are then conducted to detect not gunpowder, but the elements contained in cartridge primer — mainly lead, barium and antimony — certain thresholds of which can lead to the conclusion that a sample is "consistent with" gunshot residue.

While more reliable than the paraffin test, the newer methods were not considered foolproof, and with them, it was still not possible to say whether the substance being analyzed was definitely gunshot residue.

In 1977, research was completed on another method of detecting gunshot residue that makes use of a scanning

electron microscope to locate particles and an X-ray device to analyze them more closely.

This was the method that Saunders used.

Newer method

Developed by Aerospace Corp. under a contract with the U.S. Justice Department, the newer method, according to its developers, made it possible to conclude that particles are "unique to" gunshot residue, or are gunshot residue.

The key to making that conclusive a determination — and some scientists dispute whether it should ever be made — is finding both the right elements, including lead, antimony and barium, and the right shapes and sizes of particles.

Saunders, at McCracken's trial, testified that he had found neither barium nor antimony, but was basing his conclusion that gunshot residue was present on the spherical shapes of two lead particles he said he found on the sample.

In cases in which neither antimony or barium are detected, scientists, chemists and forensic experts interviewed by *The Inquirer* said, such a definitive conclusion should not be made:

• Guinn, of the University of California: "Unless there is barium and antimony, there is not a strong indication of gunshot residue."

• Kilty, of the FBI: "Shapes alone are not enough, not in my opinion. If antimony and barium are not present, we consider the test inconclusive."

• Ray Cooper, criminalist and lab supervisor at the Utah State Crime Laboratory in Salt Lake City: "If you find lead, barium and antimony, and it's in the right clusters and it's of spherical shape, then it's considered unique to gunshot residue. If all you find is lead, to make a statement like that, you're kind of sticking your

neck out."

• I.C. Stone, chief of the physical-evidence section of the Southwestern Institute of Forensic Sciences in Dallas: "It's very questionable. It shouldn't be too hard to find someone to come in and impeach the devil out of that guy."

• John Brown, staff member of McCrone Associates, a microanalytical consulting firm in Chicago affiliated with the McCrone Institute, where Saunders received his training in gunshot-residue detection: "That's certainly not something I would stake my life on. . . . You're on dangerous ground if you try to identify something as gunshot residue strictly by its morphology [size and shape]. Give me enough time and I can find particles from another source that look almost just like gunshot residue."

• Jones, a developer of the scanning electron microscope method of testing and a private consultant: "Saunders was just wrong. . . . He was definitely not justified in testifying that gunshot residue was found on the hand of Terence McCracken."

Jones, in a report for *The Inquirer*, said that one of the particles that Saunders found could have been said to be "consistent with" or "characteristic of" gunshot residue, but that the second, because it also contained iron, should not have been considered consistent with gunshot residue.

Jones said his review of Saunders' testimony showed that Saunders five times incorrectly referred to the particles as being gunshot residue. Two other times, Jones said, Saunders incorrectly stated that there are no sources other than gunshot residue for similar lead particles. Jones said other sources include paint, gasoline and the flints of cigarette lighters.

And four times, Jones said, Saunders incorrectly stated that the lead particles on McCracken's hands

could not have resulted from working on an automobile.

McCracken was working on a friend's car engine less than four hours before the test was administered to him, according to court testimony and interviews.

In addition, McCracken truthfully stated in a lie-detector test, according to the former FBI polygraph expert who administered the test for *The Inquirer*, that he had not fired a handgun on March 18, 1983, or ever in his life.

McCracken was in Delaware County Prison awaiting trial when his attorney, John McDougall, received permission from the court to have his own tests conducted on Saunders' samples.

Earlier, McDougall had sought to prevent Saunders' findings from being introduced in court because, according to Saunders' report, the evidence had been destroyed in testing. That, McDougall argued, was the equivalent of McCracken's not being able to confront his accuser.

But at a suppression hearing, McDougall said, Saunders testified that the evidence had not been destroyed and that he had made the notation on his report simply as a matter of routine.

Upon hearing that the evidence still existed, McDougall hired Gregory Farrington, a University of Pennsylvania chemist, to conduct his own tests. Farrington's tests were conducted July 22, 1983, in Saunders' presence.

Farrington, a chemist with little experience in detecting gunshot residue, found no lead particles in the samples. As Saunders watched, Farrington analyzed several particles

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that he concluded were inconsistent with gunshot residue, according to court testimony.

Grains of sand

But it was not until the trial that Saunders revealed that the particles Farrington had been concentrating on in his laboratory were grains of sand that he had earlier placed on the samples as markers.

"I did find major particles on the surface that weren't consistent with gunshot residue to any extent," Farrington said in an interview. "Saunders never admitted he planted them there as markers until later."

Jones, the scientist retained by *The Inquirer*, said the methods employed by Farrington in his tests would have been insufficient to detect the existence of small particles of lead, anyway.

But, Jones added, Saunders had several opportunities to assist Farrington in finding the lead particles in question and took no action.

"Saunders could have helped Farrington in his search for lead particles, but instead said nothing," Jones said. "I wonder why he did not help him. If they found the lead particles, it presumably would just corroborate his results."

"Perhaps he was worried that he himself could not find the lead particles again and therefore chose to be silent."

At McCracken's trial, Saunders indicated that the incriminating particles he said he had found could have been destroyed in testing, either before or during Farrington's tests.

"That's ridiculous," McDougall said in an interview Thursday. "The very reason Saunders was there was to make sure nothing happened to the evidence. Farrington may not have been experienced with gunshot residue, but he is experienced with a scanning electron microscope and in detecting chemicals on a surface, and he found no lead on the samples."

Farrington, in an interview, said he thought that Saunders' experience and personality — as opposed to the facts presented — swayed the jury into believing gunshot residue had been found.

"I can tell you he is not one who likes to be second-guessed," Farrington said. "He is always right, and that's because there is nobody else around here who has done the type of testing he does. His word is it, and that's it."

McDougall has already challenged the gunshot-residue test on a variety of grounds, saying that McCracken was "subtly coerced" into submitting to it, questioning the test's reliability and objecting to prosecutors' not giving him access before the trial to notes that he said Saunders had made about the test.

In an interview last week, McDougall said that because the McCracken family probably cannot afford to retain Jones, he may ask him to appear at a hearing for McCracken free of charge.

But, the attorney added, the court could prevent him from introducing new testimony about the gunshot test on the grounds that McDougall has previously challenged its reliability and that Jones' findings might not fit the legal definition of after-discovered evidence.

"If Jones is simply stating that he disagrees, we could not use him," McDougall said. "However, if Jones, as the originator of the test involved, is of a view that Saunders improperly used the test, or could not have a valid basis for his conclusions, we may have an after-discovered evidence situation."

Dennis McAndrews, the assistant district attorney in charge of the McCracken case, said: "To me, the test that Dr. Saunders ran was a very viable one. Here we found two particles of residue of the exact type that you find from gunshot residue and find virtually nowhere else in nature."

Gunshot-residue tests — which are used most often to confirm suspected suicides committed with handguns — do not prove that a person fired a gun, Guinn, of the University of California, said. Handling a gun after it was fired, or being close by when it was fired, can also result in residue being left on the skin.

"None of the methods answers the whole question," Guinn said. "Using both could make it quantitative, and we've been working on ways to run the tests in conjunction with each other, using both nuclear activation and the scanning electron microscope."

"The tests are merely corroborative. They are just one piece of a lot of pieces of evidence that all have to fit together. Nobody is ever convicted of murder on the basis of just this one test."